DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application]This invention relates to the digital disposal circuit for displaying a television signal, and relates to the primary color converting method which changes into the signal for a multi-primary color display the colour television signal which becomes a three-primary-colors method using a simple primary combination and the clip of a negative signal especially.
[0002]
[Description of the Prior Art]In the present color-television transmission system or its display, transmission from the three primary colors or the display based on the three primary colors is put in practical use, and the conventional technology of the multi-primary color display exceeding the three primary colors did not exist.
[0003]
[Problem(s) to be Solved by the Invention]For example, the present color-television standard method consists of three primary color dots, i.e., red (R) green (G), and blue (B). If these primary color dots are displayed on xy chromaticity diagram, it will become like drawing 7. The present standard method can also express the color on the outside of triangle RGB of drawing 7, and if signal level r, g, and b of the three-primary-colors point R, G, and B express arbitrary colors, the point A will be a color from which the value of r becomes negative.
[0004]However, since the luminescent color with which a level is equivalent to a negative value at the receiving set side does not exist, if its three-primary-colors point is equal at a receiver and the transmitting side, the color located in the outside of a triangle like the point A on a chromaticity diagram can be reproduced correctly. The following two methods can be considered as a method of improving this.
(i) Make a color with high chroma saturation into a three-primary-colors point by the receiving set side.
(ii) Add a color with high chroma saturation and consider it as the receiving set of many primary colors.
(i) If it is going to reproduce a wide color range by a method, it is necessary to use a color with dramatically high chroma saturation, and since luminosity is low, the color with usually high chroma saturation is more advantageous [the method of (ii)] practically.
[0005]Six primary color displays like drawing 8 as an example are considered now. New primary colors are O, P, Q, S, T, and U. It is because it is thought that it is easy to consider it as the integral multiple of this practically to have considered 6 primary colors since the present display is the three primary colors. If the signal levels of three-primary-colors each color are r, g, and b, respectively when the signal level of 6 primary-color each color expresses the color which are o, p, q, s, t, and u, respectively by a three-primary-colors system, As for (element, tristimulus-value) of light and a formula (1) are materialized

considering R, G, B, O, P, Q, S, T, and U as a matrix of 1x3.
[Equation 1]
o-O+p-P+q-Q+s-S+t-T+u-U=r-R+g-G+b-B (1)
Since equations (1) are 3 simultaneous equations, if they do not add some conditions of 6 yuan, they cannot be solved.
[0006]Then, the purpose of this invention changes the colour television signal which becomes a transmitted three-primary-colors method into the signal for a multi-primary color display, A color with high chroma saturation also uses as an offer plug the possible primary color converting method for a multi-primary color display of more specifically solving 3 simultaneous equations of 6 yuan like the above-mentioned equation (1) which can be reappeared correctly.
[0007]
[Means for Solving the Problem]In order to attain the purpose, the 1st invention that becomes a primary color converting method for this invention multi-primary color display, The luminance signal Y, two color-difference-signal C_1, and C_2 of a colour television signal which have been transmitted, Change into the three-primary-colors signal R, G, and B via a reverse matrix circuit, and it is judged in what kind of position the three-primary-colors signal R, G, and B acquired by conversion is on a chromaticity diagram, While [of many primary colors] exceeding the three primary colors independently provided on a chromaticity diagram based on the decision result, three primary colors are chosen from from, these primary combination expresses an input chrominance signal, and it was made to prepare for a multi-primary color display by a receiver.
[0008]The luminance signal Y, two color-difference-signal C_1, and C_2 of a colour television signal which have been transmitted as for the 2nd invention, Change into the three-primary-colors signal R, G, and B via a reverse matrix circuit, and calculate many primary signals exceeding the three primary colors independently provided on a chromaticity diagram by a receiver as primary combination of said three-primary-colors signal R, G, and B, respectively, and they are outputted, An adjustment signal is prepared while making the output into zero, when three primary colors are chosen from from and an output of said primary color other primary combination becomes negative, while [of many primary colors] exceeding said three primary colors, The adjustment signal is added and outputted to an output of said primary combination of said three selected primary colors, and many primary colors in a receiver were prepared for a display.
[0009]
[Example]With reference to an accompanying drawing, an example explains this invention in detail below. The luminance signal Y of the colour television signal which becomes the three-primary-colors method which was transmitted first, and by which it came and two color-difference-signals C_1, and C_2 are changed into the three-primary-colors signal R, G, and B by the usual reverse matrix circuit. The method of changing primary color dots for this three-primary-colors signal between the primary color dots more than the three primary colors in a receiver for every pixel according to the color of that input is the invention of the 1st of this application.
[0010]It is the 1st example that is 6 primary color displays and divided the color range into four possible fields (the triangle OPQ, PSQ, TOQ, TQU) of a display in the combination of the inside three primary colors at drawing 2. For example, if an input chrominance signal is in the range of the chromaticity diagram top triangle OPQ, since the solution of $q > 0.0$ is acquired when [o and p] referred to as $s=t=u=0.0$ in a formula (1) and, exact color reproduction will be performed. Conversion to o from r, g, and b, p, q, s, t, and u can be carried out with the composition of the hardware of the drawing 1 graphic display.
[0011]That there is an input level of three-primary-colors R, G, and B signal with r', g', and b' by drawing 1 shows the color component of R of the chrominance signal with which the gamma characteristic of the display by the side of a display was amended, G, and B, and it returns the amendment in the gamma characteristic gamma, and before outputting to a display after performing

primary color conversion, it is carrying out gamma characteristic correction. It is what judges in what kind of position the judging device 1 has the inputted chrominance signal on a chromaticity diagram, for example, xy chromaticity diagram, or in which field of four triangle fields shown previously, for example it is, It is chosen whether it is used whether the group of the group (6 sets) throat of the three coefficient units k perpendicularly located in a line by the result of the judgment is used.

[0012]The formula (2) which displays the chromaticity diagram top straight line PQ in order to investigate whether it is in the left of the straight line PQ, for example on a drawing 2 graphic display xy chromaticity diagram, and whether it is in the right in which of the straight line by which arbitrary colors were given on the chromaticity diagram it is

[Equation 2]

k_1, $r+k_2$, $g+k_3$, and$b=0$ (2)

Twist multiplier k_1, k_2, and k_3 are defined, r of an input chrominance signal, g, and b ingredient are multiplied by these coefficients, respectively, those primary combination is taken, and it judges by the positive/negative as a result of combination. The hard structure of this judgment is composition like drawing 3, and the composition of drawing 3 is contents of the drawing 1 graphic display judging device 1 namely.

[0013]Namely, the signal which the signal r, g, and b multiplied R of an input television signal, G, and B ingredient by the gamma coefficient, and was returned in drawing 3, The group of the coefficient of coefficient k_1, k_2, and k_3, On the drawing 2 graphic display chromaticity diagram, for example, the multiplication coefficient group for judging whether an input chrominance signal consists in which side to the straight line PQ, A thing [similarly as opposed to the straight lines OQ and QT in the group of the coefficient of the group of the coefficient of coefficient k_4, k_5, and k_6 and coefficient k_7, k_8, and k_9], In now, the group of the coefficient of coefficient k_{10}, k_{11}, and k_{12} will call it the group which is not used.

[0014]Primary combination of each multiplication output of the group of these coefficients is judged by positive [the] and negative by the judging devices 2-5 to be 0 or 1, and these outputs operate the coefficient unit group k of the drawing 1 graphic display, or are not operated, and carry out operation more specifically shown in (d) from (a) below.

[0015](a) When the color of an input is on the left of the straight line PQ, judge it as the triangle PSQ, and it is the coefficient unit k. [Equation 3]

$o=t=u=0.0$ p-P+q-Q+s-S=r-R+g-G+b-B (3)

It comes out and becomes a decided coefficient.

[0016](b) The color of an input judges it as the triangle OPQ on the right of the straight line PQ at the time on the straight line OQ, and it is the coefficient unit k. [Equation 4]

$s=t=u=0.0$ o-O+p-P+q-Q=r-R+g-G+b-B (4)

It comes out and becomes a decided coefficient.

[0017](c) The color of an input judges it as the triangle OQT under the straight line OQ at the time on the straight line QT, and it is the coefficient unit k. [Equation 5]

$p=s=u=0.0$ o-O+q-Q+t-T=r-R+g-G+b-B (5)

It comes out and becomes a decided coefficient.

[0018](d) When the color of an input is under the straight line QT, judge it as the triangle TQU, and it is the coefficient unit k. [Equation 6]

$o=p=s=0.0$ t-T+q-Q+u-U=r-R+g-G+b-B (6)

It comes out and becomes a decided coefficient.

[0019]Next, the 2nd example concerning this application 2nd invention is described. The composition of the 2nd example is shown in drawing 4. In order that the 1st example may take and change the coefficient unit k for every pixel corresponding to the color of an input, the scale of hardware becomes large, but in drawing 4, since the coefficient is set constant, the scale of hardware is small. Although some colors in hexagon OPSQUT may not be thoroughly reproduced in this composition, it is completely satisfactory practically.

[0020]With this figure, negative clip and inverted output N.C. carries out the following work. That is, when the input x (left-hand side of a figure) is positive, "x" is outputted to right-hand side and, downward, "0" is outputted.
[0021]When the input x is negative, "0" is outputted to right-hand side and, downward, "x" is outputted.
[0022]Theoretic operation of drawing 4 is explained below. The equation (1) can change with an equation (7), this makes s, t, and u an dependent variable, and unknowns are 3 yuan 3 simultaneous equations of o, p, and q.
[Equation 7]
o-O+p-P+q-Q=r-R+g-G+b-B-s-S-t-T-u-U (7)
[0023]if s, t, and u are simply expressed by primary combination of r, g, and b -- restrictions of a formula (7) -- theoretic -- o, p, q, s, t, and u -- one of values become negative to many colors inside hexagon OPSQUT which all the value should be able to express by 0 or positive. Therefore, right color reproduction is not made. In drawing 4, in order to improve this, negative clip and inverted output N.C. is used. When s, t, and u are negative, this circuit outputs "0", adds that correction term to o, p, and q, and it can solve the above-mentioned problem substantially.
[0024]in addition -- the coefficient of the coefficient unit k of a figure receives almost all the colors inside hexagon OPSQUT -- o, p, q, s, t, and u -- all the value -- 0 -- or it is beforehand decided by calculation that it just becomes.
[0025]Drawing 5 shows the hard structure at the time of applying drawing 4 to 4 primary colors.
[0026]Next, in order to understand the invention in this application more concretely, the numerical value on a chromaticity diagram is concretely given to R, G, B, O, P, Q, S, T, and U, and explanation of the drawing 4 graphic display hard structure is given to drawing 1. The case of the following chromaticity points is considered as an example.
[Equation 8]
R (0.393, 0.212, 0.019), G (0.365, 0.701, 0.112), B (0.192, 0.087, 0.958), O (0.640, 0.360, 0.000), P(0.332, 0.620, 0.048),Q(0.153, 0.024, 0.823),S(0.028, 0.398, 0.574),T(0.705, 0.295, 0.000),U(0.169, 0.007, 0.824) (8)
[0027]Each primary color is displayed with the tristimulus value X, Y, and Z of a color by a formula (8), and if shown on xy chromaticity diagram, it will become like drawing 6.
[0028]To the inputted color r, g, and b, in Example 1 (drawing 1), an area judgment is carried out as follows and a signal level is calculated.
At the time of (a)-0.7949, r+0.0569, g+0.0487, and b>0.0 [Equation 9]
o=t=u=0.0 p= 0.9623, r+1.0837, g+0.0568, and b q= 0.6681, r+0.0226, g+1.1182, and b s=-1.0057, r+0.0719, g+0.0617, and b (9)
[0029]At the time of (b)-0.7949, r+0.0569, g+0.0487, b<0.0, and -0.0082-r+0.5452-g+0.0552-b>0.0 [Equation 10]
s=t=u=0.0 o= 0.6182, r-0.0442, g-0.0378, and b p=-0.0173, r+1.1538, g+0.1168, and b q = 0.0238, r+0.0687, g+1.1577, andb (10)[0030]At the time of (c)-0.0082, r+0.5452, g+0.0552, b<0.0, and 0.0511-r+0.5820-g+0.0557-b>0.0 [Equation 11]
p=s=u=0.0 o= 0.5274, r+6.0051, g+0.5745, and b q= 0.0228, r+0.1360, g+1.1645, and b t= 0.0745, r-4.9629, g-0.5023, and b (11)[0031](d) At the time of 0.0511-r+0.5820-g+0.0557-b<0.0[Equation 12]
o=p=s=0.0q= 2.0815, r+23.579, g+3.4070, and bt= 0.5994, r+1.0138, g+0.0694, and bu=-2.0562, r-23.414, b-2.2398, and b [0032]The following calculations are performed in Example 2 (drawing 4).
[Equation 13]
$f(x) = x$, $x > 0.00$, and $x < 0.0 g(x). = 0$, $x > 0.0x$, When referred to as $x < 0.0 s_1 = -0.9182$, r+0.0825, g+0.1979, and $bt_1 = 0.2936$, r-1.8853 and g-0.3339, $bu_1 = -0.1249$, r-1.3786, g+0.7049, and b. o=-0.2972, r+2.3798, g+0.4522, b-0.6147, g (s_1)+1.2189, $g(t_1)$+0.0547, and g (u_1) p = 0.9378, r+0.5533, g-0.1118, b+0.9741, and g. (s_1). -0.2325, $g(t_1)$-0.0593, and g (u_1) q= 0.7335, r+1.4264, g+0.3273, b+0.6406, g (s_1)+0.0136, $g(t_1)$+1.0047, and g (u_1). s= f (s_1) t= f (t_1) u= f (u_1) (13)[0033]About some color samples, it is explained

what kind of value (9) - (13) type produces.
(c) r=-0.5, g= 1.0, and b= 1.0 are cases (C1 of drawing 6).
[0034]Since it is set to -0.7949, r+0.0569, g+0.0487, and b=0.503 >0.0 in Example 1, it is judged with (a), and it is from a formula (9). [Equation 14]
o=0.0 ,p=0.659 ,q=0.807 ,s=0.637 ,t=0.0 ,u=0.0 (14)[0035]At Example 2, it is from s_1=0.740, t_1=-2.367, and u=-0.637.[Equation 15]
o= 0.062, p= 0.559, q= 0.741, s= 0.740, t= 0.0, and u= 0.0 (15) and (f) In the case of r= 1.0, g= 1.0, and b= 1.0 (C2 of drawing 6)
[0036]Since it is set to -0.7949, r+0.0569, g+0.0487, and b=-0.689 <0.0-0.0082, r+0.5452, g+0.0552, and b= 0.592> 0.0 in Example 1, it is judged with (b), and it is from a formula (10). [Equation 16]
o=0.536 ,p=1.253 ,q=1.250 ,s=0.0 ,t=0.0 ,u=0.0 (16)[0037]At Example 2, it is from s_1=-0.638, t_1=-1.926, and u=-0.799.[Equation 17]
o= 0.536, p= 1.253, q= 1.250, s= 0.0, t= 0.0, and u= 0.0 (17) and (g) In the case of r= 1.0 and g=-0.05 and b= 1.0 (C3 of drawing 6)
[0038]Since it is set to -0.0082, r+0.5452, g+0.0552, and b=-0.030 <0.00.0511-r+0.5820, g+0.0557, and b= 0.028> 0.0 in Example 1, it is judged with (c), and it is from a formula (11). [Equation 18]
o=0.285 ,p=0.0 ,q=0.132 ,s=0.0 ,t=0.272 ,u=0.0 (18)[0039]At Example 2, it is from s_1=-0.903, t_1=0.355, and u_1=0.015.[Equation 19]
o= 0.184, p= 0.020, q= 0.117, s= 0.0, t= 0.355, and u= 0.015 (19) and (h) In the case of r= 0.2, g=-0.14, and b= 1.0 (C4 of drawing 6)
[0040]Since it is set to 0.0511, r+0.5820, g+0.0557, and b=-0.016 <0.0 in Example 1, it is judged with (d), and it is from a formula (12). [Equation 20]
o=0.0 ,p=0.0 ,q=0.522 ,s=0.0 ,t=0.047 ,u=0.627(20)[0041]At Example 2, it is from s_1=0.003, t_1=-0.011, and u= 0.773.[Equation 21]
o=0.046 ,p=0.001 ,q=0.274 ,s=0.003 ,t=0.0 ,u=0.773 (21)[0042]As this example showed, this invention can change a three-primary-colors signal into many primary signals also by the color of the outside of triangle RGB.
[0043]Probably the invention in this application does not have what is limited to this, although the example has explained the invention in this application to details above, probably that various kinds of modification and change are possible takes to a person skilled in the art, and it will be obvious.
[0044]
[Effect of the Invention]According to this invention primary color converting method, the color of the chromaticity point besides the triangle which the three-primary-colors point of xy chromaticity diagram top three-primary-colors R, G, and B makes with the chrominance signal of the colour television signal which becomes a three-primary-colors method is also correctly reproducible, A color with high chroma saturation is also displayed correctly, and has an advantage in which the hard structure which moreover constitutes the converting method is also comparatively easy.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]The example of hard structure of the 1st example of this invention
[Drawing 2]It is 6 primary color displays and is an example of chromaticity diagram top area division.
[Drawing 3]The example of composition of the 1st example judging device 1
[Drawing 4]The example of hard structure of the 2nd example of this invention
[Drawing 5]The example of composition of other examples (4 primary colors) of this invention
[Drawing 6]The example on the chromaticity diagram of 6 primary color displays
[Drawing 7]The display of the present standard method using a chromaticity diagram
[Drawing 8]The example on the chromaticity diagram of 6 primary color displays
[Description of Notations]

1-5 Judging device
gamma Gamma correction
gamma^{-1} inverse gamma correction
k Coefficient unit
k_1 - k_{12} coefficient unit
N.C. A negative clip and an inverted output

CLAIMS

[Claim(s)]

[Claim 1]The luminance signal Y, two color-difference-signal C_1, and C_2 of a colour television signal which have been transmitted, Change into the three-primary-colors signal R, G, and B via a reverse matrix circuit, and it is judged in what kind of position the three-primary-colors signal R, G, and B acquired by conversion is on a chromaticity diagram, A primary color converting method for a multi-primary color display characterized by choosing three primary colors from from while [of many primary colors] exceeding the three primary colors independently provided on a chromaticity diagram based on the decision result, and these primary combination expressing an input chrominance signal, and making it prepare for a multi-primary color display by a receiver.

[Claim 2]The luminance signal Y, two color-difference-signal C_1, and C_2 of a colour television signal which have been transmitted, Change into the three-primary-colors signal R, G, and B via a reverse matrix circuit, and calculate many primary signals exceeding the three primary colors independently provided on a chromaticity diagram by a receiver as primary combination of said three-primary-colors signal R, G, and B, respectively, and they are outputted, An adjustment signal is prepared while making the output into zero, when three primary colors are chosen from from and an output of said primary color other primary combination becomes negative, while [of many primary colors] exceeding said three primary colors, A primary color converting method for a multi-primary color display characterized by adding and outputting the adjustment signal to an output of said primary combination of said three selected primary colors, and making it prepare for a multi-primary color display by a receiver.

[Claim 3]when a gamma correction of a receiver display is seen, it is crowded, and inverse gamma correction of said colour television signal is carried out and it is transmitted, The primary color converting method for a multi-primary color display according to claim 1 or 2 the point's coming for primary color conversion up, carrying out the gamma correction of the three-primary-colors signal R, G, and B, respectively, and carrying out inverse gamma correction of the output many primary signals.